

What is claimed is:

1. An external additive for a toner for electrophotography comprising:

oxide fine particles which contain silicon, wherein the oxide fine particles have a primary particle diameter of 30nm to 300nm in number average, a standard deviation σ of a particle size distribution of the primary particle diameter satisfies a relation of: $R/4 \leq \sigma \leq R$, in which the R expresses the primary particle diameter, the oxide fine particles are substantially spherical having a circularity SF1 of 100 to 130 and a circularity SF2 of 100 to 125, the circularity SF1 is defined as an equation (1) and the circularity SF2 is defined as an equation (2);

$$SF1 = (L^2/A) \times (\pi/4) \times 100 \quad \text{equation (1)}$$

$$SF2 = (P^2/A) \times (1/4\pi) \times 100 \quad \text{equation (2)}$$

wherein "L" expresses the absolute maximum length of the oxide fine particles; "A" expresses a projected area of the oxide fine particles; and "P" expresses a maximum perimeter of the oxide fine particles.

2. The external additive for a toner for electrophotography according to Claim 1, wherein the oxide fine particles have the primary particle diameter of

50nm to 170nm in number average.

3. The external additive for a toner for electrophotography according to Claim 1, wherein the standard deviation σ of the particle size distribution of the primary particle diameter satisfies a relation of: $R/3 \leq \sigma \leq 2R/3$, in which the R expresses the primary particle diameter.

4. The external additive for a toner for electrophotography according to Claim 1, wherein the oxide fine particles have the circularity SF1 of 100 to 120 and the circularity SF2 of 100 to 120.

5. The external additive for a toner for electrophotography according to Claim 1, wherein the oxide fine particles further comprises a metal element.

6. The external additive for a toner for electrophotography according to Claim 5, wherein the metal element is at least one selected from Mg, Ca, Ba, Al, Ti, V, Sr, Zr, Si, Sn, Zn, Ga, Ge, Cr, Mn, Fe, Co, Ni, and Cu.

7. The external additive for a toner for electrophotography according to Claim 5, wherein the

metal element is a titanium element.

8. The external additive for a toner for electrophotography according to Claim 1, wherein elements of the oxide fine particles are uniformly dispersed between a surface of the oxide fine particles and an inner portion of the oxide fine particles.

9. The external additive for a toner for electrophotography according to Claim 1, wherein a surface of the oxide fine particles are treated with an organosilicon compound.

10. The external additive for a toner for electrophotography according to Claim 1, wherein the oxide fine particles are hydrophobic oxide fine particles having a $R^1_3SiO_{1/2}$ unit on a surface thereof, in which the R^1 is an identical or a different monovalent carbon hydrogen group having 1 to 8 carbon atoms.

11. The external additive for a toner for electrophotography according to Claim 1, wherein the oxide fine particles are treated with silicone oil, and a liberation degree of the silicone oil is 10% to 95%.

12. A toner for electrophotography comprising:

base toner particles which contain a binder resin and a coloring agent; and
an external additive,

wherein the base toner particles have a volume average particle diameter of $2\mu\text{m}$ to $7\mu\text{m}$, the external additive is mixed with the base toner particle, and the external additive comprises:

oxide fine particles which contain silicon,
wherein the oxide fine particles have a primary particle diameter of 30nm to 300nm in number average, a standard deviation σ of a particle size distribution of the primary particle diameter satisfies a relation of: $R/4 \leq \sigma \leq R$, in which the R expresses the primary particle diameter, the oxide fine particles are substantially spherical having a circularity SF1 of 100 to 130 and a circularity SF2 of 100 to 125, the circularity SF1 is defined as an equation (1) and the circularity SF2 is defined as an equation (2);

$$\text{SF1} = (L^2/A) \times (\pi/4) \times 100 \quad \text{equation (1)}$$

$$\text{SF2} = (P^2/A) \times (1/4\pi) \times 100 \quad \text{equation (2)}$$

wherein "L" expresses the absolute maximum length of the oxide fine particles; "A" expresses a projected area of the oxide fine particles; and "P" expresses a maximum

perimeter of the oxide fine particles.

13. The toner for electrophotography according to Claim 12, wherein a content of the external additive is 0.01 part by weight to 20 parts by weight, relative to 100 parts by weight of the toner.

14. The toner for electrophotography according to Claim 13, wherein a content of the external additive is 0.1 part by weight to 5 parts by weight, relative to 100 parts by weight of the toner.

15. The toner for electrophotography according to Claim 12, further comprises one or more external additives, wherein the one or more external additives have smaller particle diameter than the particle diameter of the external additive of the toner.

16. The toner for electrophotography according to Claim 12, wherein the binder resin comprises a polyol resin.

17. The toner for electrophotography according to Claim 12, wherein the binder resin comprises a polyester resin.

18. A double-component developer comprising:

a toner for electrophotography; and

a carrier,

wherein the toner comprises:

base toner particles which contain a binder resin and a coloring agent; and

an external additive,

wherein the base toner particles have a volume average particle diameter of $2\mu\text{m}$ to $7\mu\text{m}$, the external additive is mixed with the base toner particles, and the external additive comprises:

oxide fine particles which contain silicon,

wherein the oxide fine particles have a primary particle diameter of 30nm to 300nm in number average, a standard deviation σ of a particle size distribution of the primary particle diameter satisfies a relation of: $R/4 \leq \sigma \leq R$, in which the R expresses the primary particle diameter, the oxide fine particles are substantially spherical having a circularity SF1 of 100 to 130 and a circularity SF2 of 100 to 125, the circularity SF1 is defined as an equation (1) and the circularity SF2 is defined as an equation (2);

$$\text{SF1} = (L^2/A) \times (\pi/4) \times 100 \quad \text{equation (1)}$$

$$\text{SF2} = (P^2/A) \times (1/4\pi) \times 100 \quad \text{equation (2)}$$

wherein "L" expresses the absolute maximum length of the oxide fine particles; "A" expresses a projected area of the oxide fine particles; and "P" expresses a maximum perimeter of the oxide fine particles.

19. An image-forming process comprising the steps of:
- charging a latent electrostatic image bearing member;
 - irradiating light to the latent electrostatic image bearing member so as to form a latent electrostatic image;
 - supplying a developer onto the latent electrostatic image so as to visualize the latent electrostatic image and to form a toner image;
 - transferring the toner image onto a recording medium,
- wherein the developer comprises a toner for electrophotography, and the toner comprises:
- base toner particles which contain a binder resin and a coloring agent; and
 - an external additive,
- wherein the base toner particles have a volume average particle diameter of $2\mu\text{m}$ to $7\mu\text{m}$, the external additive is mixed with the base toner particles, and the external additive comprises:

oxide fine particles which contain silicon,
 wherein the oxide fine particles have a primary particle
 diameter of 30nm to 300nm in number average, a standard
 deviation σ of a particle size distribution of the primary
 particle diameter satisfies a relation of: $R/4 \leq \sigma \leq R$, in
 which the R expresses the primary particle diameter,
 the oxide fine particles are substantially spherical having a
 circularity SF1 of 100 to 130 and a circularity SF2 of 100 to
 125, the circularity SF1 is defined as an equation (1) and
 the circularity SF2 is defined as an equation (2);

$$SF1 = (L^2/A) \times (\pi/4) \times 100 \quad \text{equation (1)}$$

$$SF2 = (P^2/A) \times (1/4\pi) \times 100 \quad \text{equation (2)}$$

wherein "L" expresses the absolute maximum length of the
 oxide fine particles; "A" expresses a projected area of the
 oxide fine particles; and "P" expresses a maximum
 perimeter of the oxide fine particles.

20. The image-forming process according to Claim 19,
 wherein the developer further comprises a carrier.

21. An image-forming apparatus comprising:
 a latent electrostatic image-bearing member;
 a charger configured to charge the latent

electrostatic image-bearing member;

a light-irradiator configured to irradiate a light to the latent electrostatic image-bearing member imagewisely so as to form a latent electrostatic image;

an image-developer configured to supply a developer to the latent electrostatic image, and to visualize the latent electrostatic image, so as to form a toner image; and

a transfer configured to transfer the toner image onto a recording medium, wherein the developer comprises a carrier and a toner for electrophotography, and the toner comprises:

base toner particles which contain a binder resin and a coloring agent; and

an external additive,

wherein the base toner particles have a volume average particle diameter of $2\mu\text{m}$ to $7\mu\text{m}$, the external additive is mixed with the base toner particles, and the external additive comprises:

oxide fine particles which contain silicon,

wherein the oxide fine particles have a primary particle diameter of 30nm to 300nm in number average, a standard deviation σ of a particle size distribution of the primary particle diameter satisfies a relation of: $R/4 \leq \sigma \leq R$, in which the R expresses the primary particle diameter,

the oxide fine particles are substantially spherical having a circularity SF1 of 100 to 130 and a circularity SF2 of 100 to 125, the circularity SF1 is defined as an equation (1) and the circularity SF2 is defined as an equation (2);

$$SF1 = (L^2/A) \times (\pi/4) \times 100 \quad \text{equation (1)}$$

$$SF2 = (P^2/A) \times (1/4\pi) \times 100 \quad \text{equation (2),}$$

wherein "L" expresses the absolute maximum length of the oxide fine particles; "A" expresses a projected area of the oxide fine particles; and "P" expresses a maximum perimeter of the oxide fine particles.